

PATENT ABSTRACTS OF JAPAN

(11)Publication number : 05-168595

(43)Date of publication of application : 02.07.1993

(51)Int.Cl.

A61B 3/10

(21)Application number : 03-343204

(71)Applicant : HOYA CORP

(22)Date of filing : 25.12.1991

(72)Inventor : AKIYAMA HISANORI

YODA TOSHIRO

IKEDA KAZUTADA

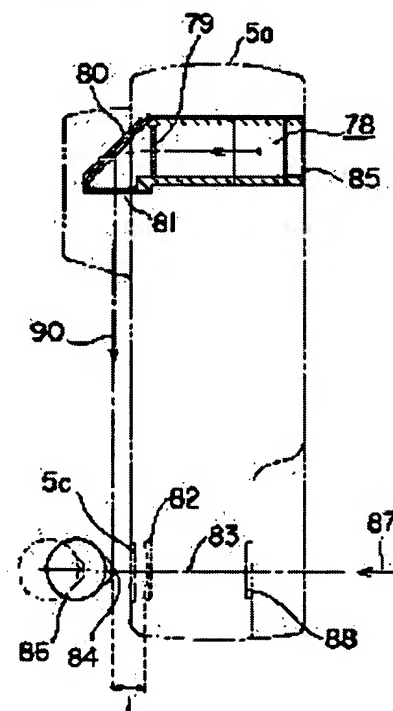
ITO NORIYASU

(54) VERTEX ADJUSTING DEVICE AND METHOD OF OPHTHALMIC APPARATUS

(57)Abstract:

PURPOSE: To accurately adjust a vertex to a predetermined value in an ophthalmic apparatus.

CONSTITUTION: When the iris of an eye is irradiated with light, noticing a point where the iris looks bright, laser beam having a cross-sectional area larger than the size of the eye 86 of an examinee is emitted to the point 84 on the optical axis 83 at a predetermined distance from a measuring lens 82 in the direction (arrow 90) vertical to the optical axis of the measuring lens 32. The eye 86 of the examinee is observed through an observation window 88 in the direction shown by an arrow 87 while the distance between the measuring lens 82 and the apex of the cornea of the eye 86 of the examinee is changed and, when the reflected light of the iris generated when the iris of the eye 86 of the examinee is irradiated with laser beam is detected, the change of the distance between the measuring lens 82 and the apex of the cornea of the eye 86 of the examinee is stopped. By this constitution, a vertex can be simply and accurately adjusted to a predetermined value.



LEGAL STATUS

[Date of request for examination]

01.07.1998

[Date of sending the examiner's decision of rejection]

[Kind of final disposal of application other than the
examiner's decision of rejection or application]

converted registration]

[Date of final disposal for application]

[Patent number] 3165207

[Date of registration] 02.03.2001

[Number of appeal against examiner's decision of rejection]

[Date of requesting appeal against examiner's decision of rejection]

[Date of extinction of right]

Copyright (C); 1998,2003 Japan Patent Office

* NOTICES *

Japan Patent Office is not responsible for any damages caused by the use of this translation.

1. This document has been translated by computer. So the translation may not reflect the original precisely.
2. **** shows the word which can not be translated.
3. In the drawings, any words are not translated.

DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Industrial Application] Especially this invention relates to the bar tex adjusting device and the adjustment approach of optometry equipment of adjusting the distance of a measurement lens and the cornea top-most vertices of the eye of an operating personnel-ed to accuracy, about the bar tex adjusting device and the adjustment approach of optometry equipment.

[0002]

[Description of the Prior Art] Generally, glasses are designed on the assumption that the distance of the back side of a lens and the cornea top-most vertices of an eye is a predetermined value [mm], 12 [for example,]. Therefore, after adjusting the distance (this is hereafter called "bar tex") of a measurement lens and the cornea top-most vertices of the eye of an operating personnel-ed to a predetermined value also in optometry equipment at accuracy, it is necessary to examine the eyes.

[0003] Conventionally, there is the frame reliance section by which the frame of an operating personnel-ed is contacted in optometry equipment, it enables it to be manually moved to the cross direction of an operating personnel-ed, and this frame reliance section adjusts bar tex by this. Moreover, the optical-system observation equipment which can observe the eye of an operating personnel-ed from the side of an operating personnel-ed is formed in optometry equipment. This observation equipment has the vertical sight vane equipped with the reference point mark for abolishing the parallax between the pointer scale of the transparence which showed the predetermined location where bar tex becomes a predetermined value in the middle of that optical system, and a pointer scale and the eye of an operating personnel-ed.

[0004] Drawing 12 is drawing showing the situation when seeing the eye of an operating personnel-ed through observation equipment. An operating personnel looks into observation equipment, carries out small migration of the location of its eye, makes the red mark 123 which shows the reference point 121, 122 of a vertical sight vane, and the predetermined location of a pointer scale agree, and abolishes parallax. Marks 123a-123d are marks which are prepared in a pointer scale and show the red mark 123 order. The eye of an operating personnel-ed is observed with the agreement condition. The eye of the operating personnel-ed from the side is visible to observation equipment. And the location of the eye of an operating personnel-ed is moved and the cornea top-most vertices 124 of the eye of an operating personnel-ed are made to agree to the red mark 123 of a pointer scale by moving the frame reliance section. It means that bar tex was adjusted to the predetermined value by this.

[0005]

[Problem(s) to be Solved by the Invention] However, although it was required with the observation equipment of conventional optometry equipment for the cornea top-most-vertices location of the eye of an operating personnel-ed to look good to an operating personnel through observation equipment in order to check that the cornea top-most vertices of the eye of an operating personnel-ed agree in the predetermined location of a pointer scale, looking at the cornea top-most-vertices location of the eye of an operating personnel-ed, it could not be clearly seen actually. It is idea **** that light does not reach an eye well even if optometry equipment is equipped with the lighting which illuminates the face of that the lighting of the chamber on which optometry equipment was put is dark as the cause, or an operating personnel-ed etc. Moreover, when a light strong against the eye of an operating personnel-ed was applied to reverse, the problem of ***** also had an operating personnel-ed.

[0006] Moreover, the operating personnel was not easy to maintain the condition that it is necessary to look into observation equipment, to move the location of one's eye, and to abolish parallax, it is necessary to observe the cornea top-most vertices of the eye of an operating personnel-ed with the condition that the parallax does not exist, and there is no parallax for an operating personnel.

[0007] It was a difficult activity that the above thing becomes a cause and adjusts bar tex to a predetermined value with conventional optometry equipment at accuracy. This invention is made in view of such a point, and it aims at offering the bar tex adjusting device and approach of optometry equipment that bar tex can be adjusted to a predetermined value at accuracy.

[0008]

[Means for Solving the Problem] In the bar tex adjusting device of the optometry equipment which has the measuring head section in order to solve the above-mentioned technical problem in this invention A light beam exposure means to turn to the point on said optical axis of a predetermined distance the light beam which has the cross section of a small area compared with the magnitude of the eye of an operating personnel-ed, and to irradiate it from said measurement lens from a direction vertical to the optical axis of a measurement lens, When the reflected light of said iris generated when the distance of the observation port which observes the eye of an operating personnel-ed, and a measurement lens and the cornea top-most vertices of the eye of an operating personnel-ed is changed and said light beam is irradiated by the iris of the eye of an operating personnel-ed is detected, The bar tex adjusting device of the optometry equipment characterized by having a change means to stop change of said distance is offered.

[0009] In the bar tex adjustment approach of optometry equipment a light beam moreover, from a direction vertical to the optical axis of a measurement lens Irradiate towards the point on said optical axis of a predetermined distance from a measurement lens, and the distance of a measurement lens and the cornea top-most vertices of the eye of an operating personnel-ed is changed. When the reflected light of said iris generated when said light beam is irradiated by the iris of the eye of an operating personnel-ed is supervised and the reflected light of said iris is detected, The bar tex adjustment approach of the optometry equipment characterized by stopping change of the distance of said measurement lens and cornea top-most vertices of the eye of an operating personnel-ed is offered.

[0010]

[Function] Paying attention to the point which can shine and be seen, from a direction vertical to the optical axis of a measurement lens, the light beam which has the cross section of a small area compared with the magnitude of the eye of an operating personnel-ed will be turned to the point on said optical axis of a predetermined distance from a measurement lens, and this invention will irradiate it, if light is irradiated by the iris of an eye. On the other hand, when the reflected light of the iris generated when the eye of an operating personnel-ed is observed and said light beam is irradiated by the iris of the eye of an operating personnel-ed is detected changing the distance of a measurement lens and the cornea top-most vertices of the eye of an operating personnel-ed, change of the distance of a measurement lens and the cornea top-most vertices of the eye of an operating personnel-ed is stopped. Thereby, bar tex can be easily adjusted to a predetermined value at accuracy.

[0011]

[Example] Hereafter, one example of this invention is explained based on a drawing. Drawing 2 is the whole optometry equipment block diagram. Optometry equipment consists of the measuring head section 1 equipped with the measurement device of a visual function including the object for **, and the object for **, a measuring head supporter 2 supported for the measuring head section 1, enabling free vertical movement and a free level revolution, the optometry table section 3, and the base section 4 which supports these.

[0012] Drawing 3 is an external view from [of the measuring head section 1 of drawing 2] a tooth back (operating-personnel-ed side). The measuring head section 1 consists of the measurement lens unit section 5 and the PD device section 6. It consists of the unit sections 5a and 5b for right and left, and various kinds of measurement lenses for visual function measurement, such as spherical-surface measurement of the eye of an operating personnel-ed, an astigmometry, astigmatism axonometry, and prism measurement, and an attachment lens are contained, the measurement lens unit section 5 makes various visual field conditions, and optometry has come to be able to do it by combining these lens groups. The measurement lens unit section 5 is hung from PD device section 6, and is lowered, and PD device section 6 builds in the device in which spacing of unit section 5a for the left eyes of the measurement lens unit section 5 and unit section 5b for right eyes is adjusted according to the pupillary distance (PD) of an operating personnel-ed.

[0013] There are measurement apertures 5c and 5d in the unit sections 5a and 5b for the left right eyes of the measurement lens unit section 5, respectively, and the eyes are examined, making an operating personnel-ed look into these measurement apertures 5c and 5d with both eyes, respectively. On the occasion of this optometry, the vertical direction adjustment which makes in agreement with the optical axis of the eye of an operating personnel-ed also to the vertical direction the optical axis of the lens for measurement installed in the measurement apertures 5c and 5d other than adjustment of the above-mentioned pupillary distance, and cross-direction adjustment which adjusts the distance (bar tex) of the lens for measurement and the cornea top-most vertices of the eye of an operating personnel-ed to a predetermined value [mm], 12 [for example,], are performed.

[0014] The supporter material 7 of head means for supporting is fixed to PD device section 6, and the frame reliance member 10 grade in which the frame of cross-direction migration equipment 8 (not shown to drawing 3), vertical migration equipment 9, and an operating personnel-ed is contacted by the supporter material 7 is prepared in it. Cross-direction migration equipment 8 is equipment which moves the frame reliance member 10 to the cross direction of an operating personnel-ed, and adjusts bar tex to a predetermined value, and vertical migration equipment 9 is equipment which makes the optical axis of the lens for measurement in agreement with the optical axis of the eye of an operating personnel-ed to the vertical direction.

[0015] Drawing 4 shows the supporter material 7 of the above-mentioned head means for supporting, cross-direction migration equipment 8, vertical migration equipment 9, and frame reliance member 10 grade, and is the fragmentary sectional view of the A-A side of drawing 3 . The supporter material 7 is a rectangular metal plate, and is being fixed to PD device section 6 with the screw thread (not shown). The fixed bracket 11 ****s in the supporter material 7, and it is fixed to it by 12. Cross-direction migration equipment 8 is attached in the fixed bracket 11. That is, while DC motor 8a which is the driving source of cross-direction migration equipment 8 ****s and being fixed by 8a and 8b, housing 8d ****s to the fixed bracket 11, and it is fixed to it by 8e and 8f. 8g of driving pulleys with a gear tooth is arranged by the output shaft of DC motor 8a. The actuation control unit (it does not illustrate to drawing 4 but illustrates to drawing 6) to which the input unit was connected is electrically connected to DC motor 8a.

[0016] Round bar-like screw-thread shaft 8i penetrates housing 8d to housing 8d, and is prepared in it. Subordination pulley 8h with a gear tooth is fixed to the one side of screw-thread shaft 8i, and a male screw is formed in the other side, and thrust-bearing 8j is prepared in pars intermedia. By thrust-bearing 8j, screw-thread shaft 8i can be freely rotated to housing 8d, and moves to a cross direction (longitudinal direction of drawing 4). Between subordination pulley 8h and 8g of driving pulleys, belt 8 with gear tooth k is laid.

[0017] Cylinder space with the axial center of screw-thread shaft 8i and an axial center in agreement is established in housing 8d of the neighborhood which screw-thread shaft 8i penetrates, and 8m of migration members of almost a bell shape is inserted in it in this cylinder space. 8m of migration members has a female screw inside, and this female screw engages them to the male screw of screw-thread shaft 8i. 8m of migration members is freely movable to a cross direction (longitudinal direction of drawing 4) to housing 8d, and they are prepared in a hand of cut so that it may not rotate. That is, 8n of key ways is prepared in housing 8d at shaft orientations, and sensor pin 8p which was located in 8n of key ways and which is a key is fixed to 8m of migration members, and it is carried out as [carry out / 8m of migration members can move to a cross direction freely, and / members / by the interaction of 8n of these key ways, and sensor pin 8p / a revolution]. Sensor pin 8p is used for location detection of 8m of migration members. That is, sensor adapter plate 8q is fixed to housing 8d, and the sensors 8r and 8s which detect contiguity of sensor pin 8p are arranged in two predetermined locations of sensor adapter plate 8q. Sensors 8r and 8s are connected to the above-mentioned actuation control unit.

[0018] Sensors 8r and 8s are sensors for detecting the ends marginal location of the movable range of 8m of migration members, and when sensor pin 8p approaches Sensors 8r and 8s, they output a limit signal, respectively. Those limit signals are sent to an actuation control unit, and actuation of DC motor 8a is controlled.

[0019] Vertical migration equipment 9 is attached in the end of 8m of migration members. That is, dummy support 9a whose one side is a flat surface is fixed to the end of 8m of migration members, and ball plunger 9b is laid under the this dummy support 9a. Sheet metal-like click plate 9c is prepared in the vertical direction of drawing 4 free [a slide] to dummy support 9a at the flat-surface side of dummy support 9a. Click plate 9c has four holes, and ball plunger 9b engages with the above-mentioned hole, and it holds click plate 9c by four places. 9d of slide metallic ornaments is joined to click plate 9c, dummy support 9a and click plate 9c are inserted in between, and presser-foot metallic-ornaments 9e slid in the vertical direction with 9d of slide metallic ornaments is fixed to 9d of slide metallic ornaments. 9f of parallel pins which change from the round bar which penetrates 9d of slide metallic ornaments to the longitudinal direction (direction vertical to the space of drawing 4) of an operating personnel-ed to 9d of slide metallic ornaments is prepared. Frame reliance bracket 9g is attached in the ends which projected from 9d of slide metallic ornaments of 9f of this parallel pin free [rotation] centering on the shaft of 9f of parallel pins. The frame reliance member 10 is fixed to frame reliance bracket 9g. The frame reliance member 10 has structure with the flat surface which curved for a while to the longitudinal direction along with the frame of an operating personnel-ed. Furthermore, two coil springs 9h and 9i (refer to drawing 5) are formed in 9d of slide metallic ornaments, and coil springs 9h and 9i energize the frame reliance member 10 to the counterclockwise rotation of drawing 4 centering on the shaft of 9f of parallel pins. The energization force of these coil springs 9h and 9i is adjusted to extent to which the field where the frame of the frame reliance member 10 hits is always parallel mostly to 9d of slide metallic ornaments, when the frame of an operating personnel-ed is contacted by the frame reliance member 10. Therefore, the field where the frame of the frame reliance member 10 hits has become upward for a while with coil springs 9h and 9i, while the frame of an operating personnel-

ed is not contacted, but if the frame of an operating personnel-ed is contacted and reverse is pushed on coil springs 9h and 9i, it will be in a vertical condition mostly.

[0020] Drawing 5 is the side elevation which looked at head means for supporting from the right-hand side of drawing 4. Drawing 6 is the block diagram showing the configuration of an actuation control device. The actuation control unit 60 consists of a PD head substrate 61 and a Maine control substrate 62, and an input unit 63 is connected to the Maine control substrate 62. The PD head substrate 61 carries the control unit which performs the output control including Sensors 8r and 8s of the various motors of PD device section 6 including the input control of the various sensors of PD device section 6, and DC motor 8a etc. In the PD head substrate 61, the current for normal rotation or reversal is supplied to DC motor 8a according to the command signal of the motorised initiation inputted through the Maine control substrate 62 from an input unit 63, and a halt, and the limit signal from Sensors 8r and 8s. The Maine control substrate 62 carries in drawing the control unit which performs various control of the whole optometry equipment of data communication with the power-source communication link substrate which is not shown, control of a data display system, control of various lamps or a solenoid, control of a mouse, control of a printer, etc. including data communication with the PD head substrate 61.

[0021] Below, actuation of the head means for supporting constituted as mentioned above is explained. First, actuation of cross-direction migration equipment 8 is explained. If the command to which the frame reliance member 10 is moved to the input unit 63 connected to the actuation control unit 60 by the operating personnel at front or the back is given, an actuation current will be supplied to DC motor 8a from the PD head substrate 61. Thereby, DC motor 8a rotates in the direction of either. The revolution is ****ed through the output shaft of DC motor 8a, 8g of driving pulleys, belt 8with gear tooth k, and subordination pulley 8h in order, and is transmitted to shaft 8i. According to an operation of the female screw of the male screw of screw-thread shaft 8i and 8m of migration members, rotation of screw-thread shaft 8i is changed into the rectilinear motion which is 8m of migration members. Therefore, according to the revolution of DC motor 8a, 8m of migration members moves to the cross direction of an operating personnel-ed. By migration to the cross direction of 8m of migration members, the frame reliance member 10 also moves to a cross direction.

[0022] By migration to the cross direction of the frame reliance member 10, when the iris of an operating personnel-ed shines so that it may explain in full detail behind (i.e., when the actual bar tex of an operating personnel-ed which had applied the frame to the frame reliance member 10 becomes a predetermined value), an operating personnel issues the command which makes an input unit 63 suspend migration of the frame reliance member 10. Thereby, the frame reliance member 10 can be adjusted to a desired location.

[0023] In addition, since a limit signal is outputted to the PD head substrate 61 from sensor 8r or sensor 8s when sensor pin 8p approaches sensor 8r or sensor 8s (i.e., when 8m of migration members reaches the ends marginal location of an order successive range), when there is an input of this signal, the PD head substrate 61 suspends supplying an actuation current to DC motor 8a. It is prevented that 8m of migration members moves across the ends marginal location of an order successive range by this.

[0024] Below, actuation of vertical migration equipment 9 is explained. First, the measuring head section 1 of optometry equipment is moved in the vertical direction by the function of the measuring head supporter 2, and the measurement apertures 5c and 5d of the measurement lens unit section 5 are doubled with the location of the eye of an operating personnel-ed. Next, the frame reliance member 10 is moved in the vertical direction to dummy support 9a, and in either of the four locations which carry out a click halt, it adjusts so that the frame reliance member 10 may contact the frame of an operating personnel-ed.

[0025] Below, when bar tex changes with cross-direction migration equipment 8 as mentioned above, a means to detect that bar tex became a predetermined value is explained.

[0026] Drawing 1 is the B-B sectional view of the measurement lens unit section 5 in drawing 2, and drawing 7 is the C-C sectional view of the measurement lens unit section 5 in drawing 2. First, in drawing 7, it is guided in the optical-path configuration section 72, it is condensed with a condenser lens 73, and the light by which outgoing radiation was carried out from the lamp 71 results in a target 75 through a mirror 74. The target 75 has slit 75a, as shown in drawing 8 (C).

[0027] Through a mirror 76, an objective lens 77, a half mirror 78, and a vertical sight vane 79, it moves to drawing 1 and the light which penetrated slit 75a of a target 75 results in the optical axis 83 of the measurement lens 82 prepared in the measurement lens unit section 5 through a mirror 80 and a pointer scale 81 further. The measurement lens 82 counters measurement aperture 5c, and is prepared in the interior of the measurement lens unit section 5. The point 84 that this slit light results in an optical axis 83 is adjusted so that the distance L from the back side of the measurement lens 82 may become a predetermined value [mm], 12 [for example,]. An objective lens 77 is adjusted so that the image of slit 75a of a target 75 may carry out image formation on a point 84, and the sense of a target 75 is installed so

that the longitudinal direction of slit 75a by which image formation is carried out to a point 84 may become in the direction vertical to the space of drawing 1 . Therefore, when slit light is irradiated by the side face of an operating personnel-ed so that it may mention later, slit light is prolonged in the vertical direction of an operating personnel-ed. [0028] Drawing 8 (A) shows a vertical sight vane 79, and drawing 8 (B) shows a pointer scale 81. In this example, it lets a half mirror 78 pass, and like conventional equipment, the vertical sight vane 79 and the pointer scale 81 are installed so that adjustment of bar tex can be performed also from an observation port 85. Of course, a vertical sight vane 79 and pointer scales 81 are not requirements indispensable for this invention.

[0029] The procedure of detecting bar tex having become a predetermined value is explained below using the bar tex detection means constituted as mentioned above. First, the pupillary distance is adjusted by PD device section 6, and vertical migration of the PD device section 6 is carried out, and the optical axis 83 of the measurement lens 82 of the measurement lens unit section 5 is made in agreement with the optical axis (or optical axis) of the eye 86 of an operating personnel-ed. Next, the frame reliance member 10 is moved with vertical migration equipment 9, and the frame reliance member 10 is made to contact the location where the frame of an operating personnel-ed is suitable. An operating personnel observes the eye 86 of an operating personnel-ed through an observation port 88 from the direction of an arrow head 87 at the same time it drives cross-direction migration equipment 8 as mentioned above and moves the frame reliance member 10 to a cross direction in this condition. Cross-direction migration equipment 8 usually operates so that the frame of an operating personnel-ed may be gradually brought close to the measurement lens unit section 5 from a distant place.

[0030] Drawing 9 (A) shows the eye of the slit light seen from the direction of an arrow head 90 (drawing 1), and an operating personnel-ed. The light which penetrated slit 75a of a target 75 as mentioned above is carrying out image formation to the point 84 on an optical axis 83 as a slit light 89. If the eye 86 of an operating personnel-ed approaches the location of the slit light 89 with cross-direction migration equipment 8 and the slit light 89 is irradiated at the head of the eye 86 of an operating personnel-ed, light will reach the iris through a cornea and the iris of the eye 86 of an operating personnel-ed will shine. That is, as an eye is shown in drawing 9 (B) expressed from the transverse plane, an eye 86 has iris 86a in a core, and this iris 86a has the property reflected strongly, when light is irradiated from the exterior. therefore, if the slit light 89 is irradiated at the head of the eye 86 of an operating personnel-ed, pass a cornea - iris 86a -- light -- arriving -- a part of iris 86a of the eye 86 of an operating personnel-ed -- it seems that 86aa shone. Therefore, if the operating personnel is observing the eye 86 of an operating personnel-ed through an observation port 88 from the direction of an arrow head 87, the flash with which iris 86a of the eye 86 of an operating personnel-ed shines can be checked, and the flash when the slit light 89 reached at the head of the eye 86 of an operating personnel-ed, i.e., the flash when bar tex became a predetermined value, can be detected in this way. An operating personnel operates an input unit 63 to this flash, and stops actuation of cross-direction migration equipment 8 at it.

[0031] The flash when bar tex became a predetermined value tends [very] to check the detection technique of this bar tex detection means in order to detect brightness by the iris compared with the conventional technique which detects a cornea location. moreover, an operating personnel does not have to carry out parallax doubling and is observing the eye 86 of an operating personnel-ed only through an observation port 88 -- sufficient -- the observation is not affected even if the location of the eye of an operating personnel moves at least a few.

[0032] Slit light is not used for this example, but like conventional equipment, the vertical sight vane 79 and the pointer scale 81 are installed in it so that an operating personnel may observe the location of the cornea top-most vertices of the eye of an operating personnel-ed from an observation port 85 and adjustment of bar tex can also be performed. The procedure of this adjustment is explained using drawing 10 and drawing 11 .

[0033] Drawing 10 corresponds to drawing 1 and drawing 11 is the sectional view of the measurement lens unit section 5 corresponding to drawing 7 . An operating personnel looks into an observation port 85 through the direction of an arrow head 91, moves a little location of its eye, makes in agreement the reference point marks 79a and 79b of a vertical sight vane 79, and red mark 81a (refer to drawing 8) of a pointer scale 81, and abolishes parallax. While it has been a location without the parallax, the eye 86 of an operating personnel-ed is observed, and by actuation of cross-direction migration equipment 8, when the cornea top-most vertices of the eye 86 of an operating personnel-ed move and it agrees in red mark 81a of a pointer scale 81, an operating personnel operates an input unit 63 and stops actuation of cross-direction migration equipment 8. Thereby, bar tex is adjusted to a predetermined value.

[0034] Although light irradiated by the eye of an operating personnel-ed from a side face was made into slit light in the above example, not slit light but a punctiform spot light is not necessarily sufficient. Anyway, the light irradiated by the optical axis 83 should just be a light beam with width of face narrow in optical-axis 83 direction.

[0035] Moreover, although actuation stops when bar tex becomes a predetermined value by actuation to the input device 63 by the operating personnel, cross-direction migration equipment 8 establishes independently the means for stopping which stops actuation of cross-direction migration equipment 8, and when an echo of the iris of the eye of an

operating personnel-ed is detected, it may operate the above-mentioned means for stopping manually automatically.
[0036]

[Effect of the Invention] As explained above, it constituted from this invention so that bar tex might be adjusted to a predetermined value based on the reflected light of the iris generated when a light beam is turned to the point on said optical axis of a predetermined distance from a measurement lens from a direction vertical to the optical axis of a measurement lens, it irradiates and a light beam is irradiated by the iris of the eye of an operating personnel-ed. For this reason, in order to detect brightness by the iris compared with the conventional technique which detects a cornea location, it is very easy to check the flash when bar tex became a predetermined value. moreover, an operating personnel does not have to carry out parallax doubling and is observing the eye of an operating personnel-ed only through an observation port -- sufficient -- the observation is not affected even if the location of the eye of an operating personnel moves at least a few. Therefore, it became possible to adjust bar tex to a predetermined value at accuracy.

[Translation done.]

* NOTICES *

Japan Patent Office is not responsible for any damages caused by the use of this translation.

1. This document has been translated by computer. So the translation may not reflect the original precisely.
2. **** shows the word which can not be translated.
3. In the drawings, any words are not translated.

CLAIMS

[Claim(s)]

[Claim 1] The bar tex adjusting device of the optometry equipment which has the measuring head section characterized by providing the following A light beam exposure means to turn to the point on said optical axis of a predetermined distance the light beam which has the cross section of a small area compared with the magnitude of the eye of an operating personnel-ed, and to irradiate it from said measurement lens from a direction vertical to the optical axis of said measurement lens A change means to stop change of said distance when the reflected light of said iris generated when the distance of the observation port which observes the eye of an operating personnel-ed, and a measurement lens and the cornea top-most vertices of the eye of an operating personnel-ed is changed and said light beam is irradiated by the iris of the eye of an operating personnel-ed is detected

[Claim 2] The light beam from said light beam exposure means is the bar tex adjusting device of the optometry equipment according to claim 1 irradiated towards the eye of an operating personnel-ed from the side face of an operating personnel-ed.

[Claim 3] The light beam irradiated from said light beam exposure means is the bar tex adjusting device of the optometry equipment according to claim 2 characterized by being the slit light to which the cross-section configuration extended in the vertical direction of an operating personnel-ed.

[Claim 4] In the bar tex adjustment approach of optometry equipment a light beam from a direction vertical to the optical axis of a measurement lens Irradiate towards the point on said optical axis of a predetermined distance from a measurement lens, and the distance of a measurement lens and the cornea top-most vertices of the eye of an operating personnel-ed is changed. The bar tex adjustment approach of the optometry equipment characterized by what change of the distance of said measurement lens and cornea top-most vertices of the eye of an operating personnel-ed is stopped for when the reflected light of said iris generated when said light beam is irradiated by the iris of the eye of an operating personnel-ed is supervised and the reflected light of said iris is detected.

[Claim 5] Said light beam is the bar tex adjustment approach of the optometry equipment according to claim 4 irradiated towards the eye of an operating personnel-ed from the side face of an operating personnel-ed.

[Claim 6] Said light beam is the bar tex adjustment approach of the optometry equipment according to claim 5 characterized by being the slit light to which the cross-section configuration extended in the vertical direction of an operating personnel-ed.

[Translation done.]

* NOTICES *

Japan Patent Office is not responsible for any damages caused by the use of this translation.

1. This document has been translated by computer. So the translation may not reflect the original precisely.
2. **** shows the word which can not be translated.
3. In the drawings, any words are not translated.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] It is the sectional view of the measurement lens unit section of this invention.

[Drawing 2] It is the whole optometry equipment block diagram.

[Drawing 3] It is an external view from [of the measuring head section of drawing 2] a tooth back (operating-personnel-ed side).

[Drawing 4] It is the fragmentary sectional view showing the supporter material of head means for supporting, cross-direction migration equipment, vertical migration equipment, a frame reliance member, etc.

[Drawing 5] It is the side elevation which looked at head means for supporting from the right-hand side of drawing 4 .

[Drawing 6] It is the block diagram showing the configuration of an actuation control device.

[Drawing 7] It is the C-C sectional view of the measurement lens unit section in drawing 2 .

[Drawing 8] (A) is drawing in which (B) shows a pointer scale and (C) shows a target for a vertical sight vane.

[Drawing 9] (A) is drawing showing the eye as which (B) regarded the eye of the slit light seen from the direction of the arrow head 90 of drawing 1 , and an operating personnel-ed from the transverse plane.

[Drawing 10] It is the sectional view of the measurement lens unit section corresponding to drawing 1 when not using slit light.

[Drawing 11] It is the sectional view of the measurement lens unit section corresponding to drawing 7 when not using slit light.

[Drawing 12] It is drawing showing the situation when seeing the eye of an operating personnel-ed through conventional observation equipment.

[Description of Notations]

1 Measuring Head Section

2 Measuring Head Supporter

3 Optometry Table Section

4 Base Section

5 Measurement Lens Unit Section

6 PD Device Section

7 Supporter Material

8 Cross-Direction Migration Equipment

9 Vertical Migration Equipment

10 Frame Reliance Member

71 Lamp

73 Condenser Lens

74 Mirror

75 Target

75a Slit

76 Mirror

77 Objective Lens

78 Half Mirror

79 Vertical Sight Vane

80 Mirror

81 Pointer Scale

82 Measurement Lens

83 Optical Axis

84 Point

[Translation done.]

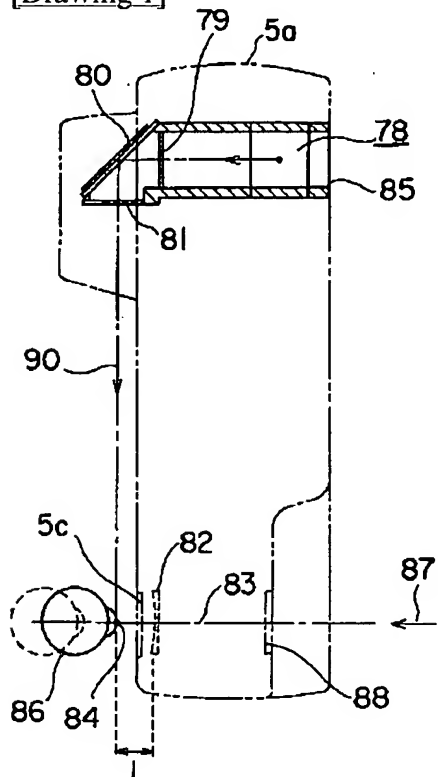
* NOTICES *

Japan Patent Office is not responsible for any damages caused by the use of this translation.

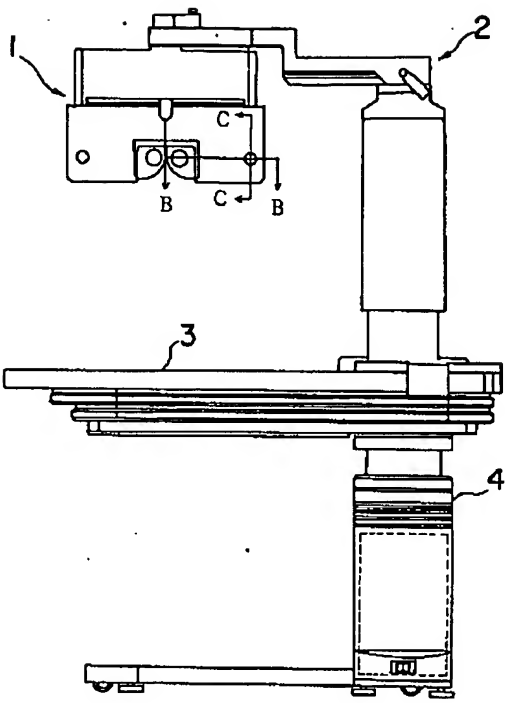
1. This document has been translated by computer. So the translation may not reflect the original precisely.
2. **** shows the word which can not be translated.
3. In the drawings, any words are not translated.

DRAWINGS

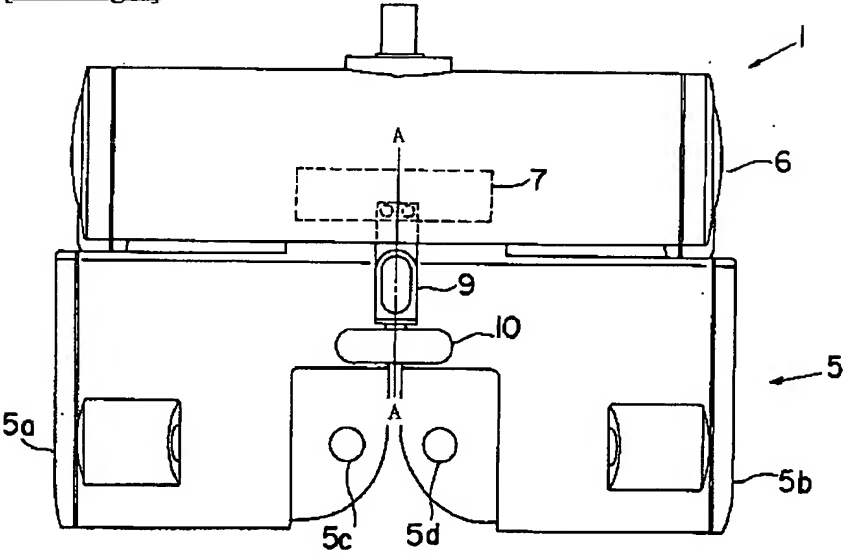
[Drawing 1]



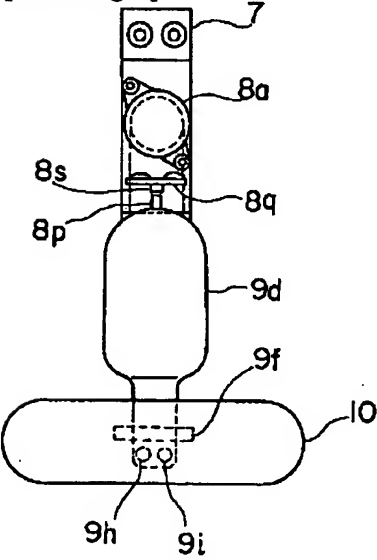
[Drawing 2]



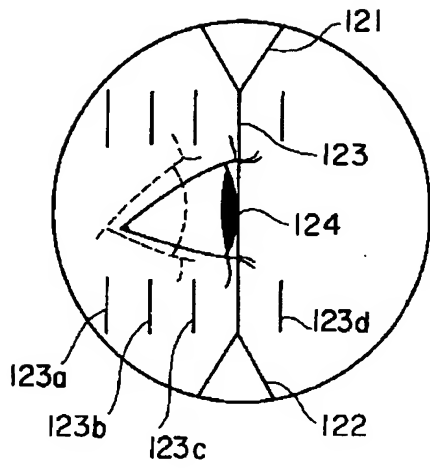
[Drawing 3]



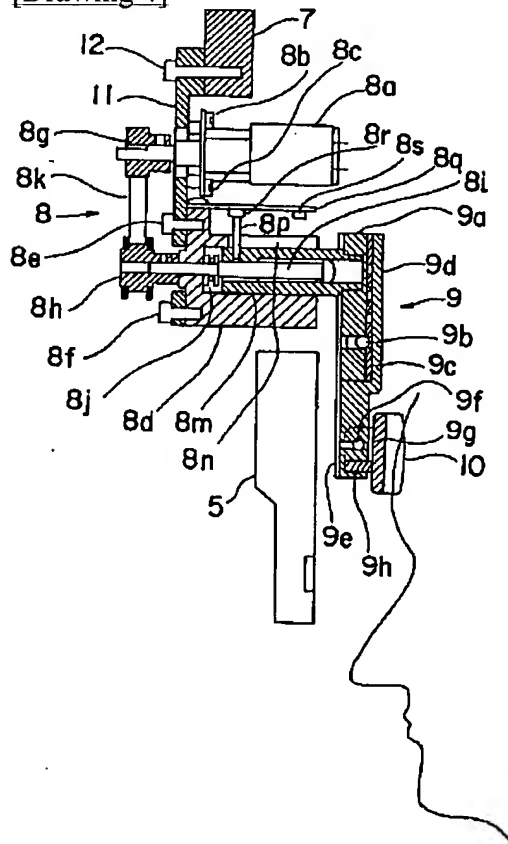
[Drawing 5]



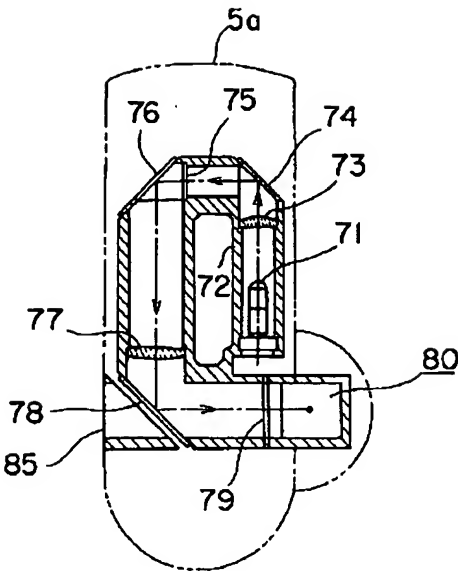
[Drawing 12]



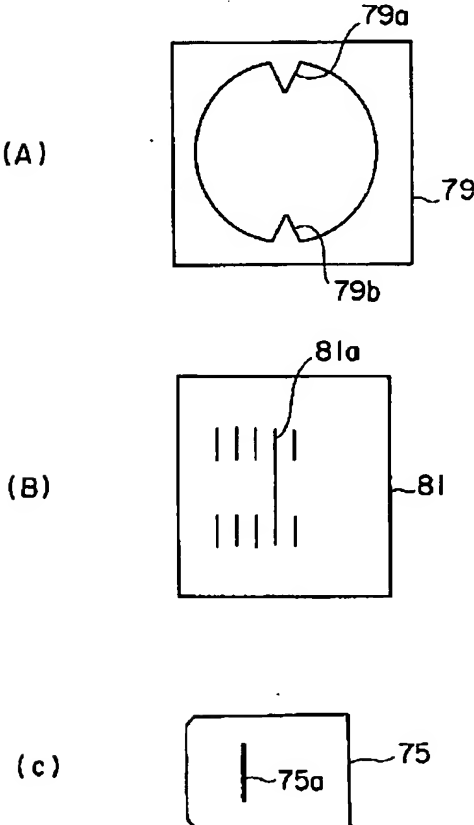
[Drawing 4]



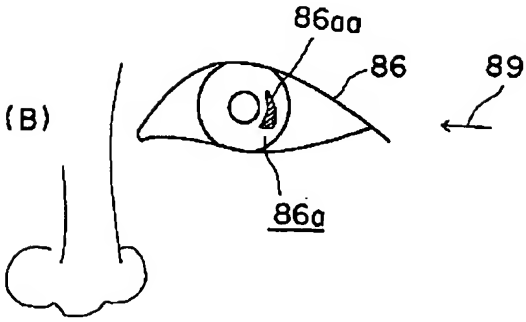
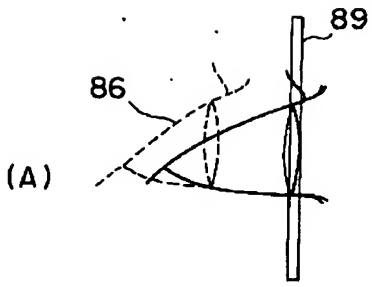
[Drawing 7]



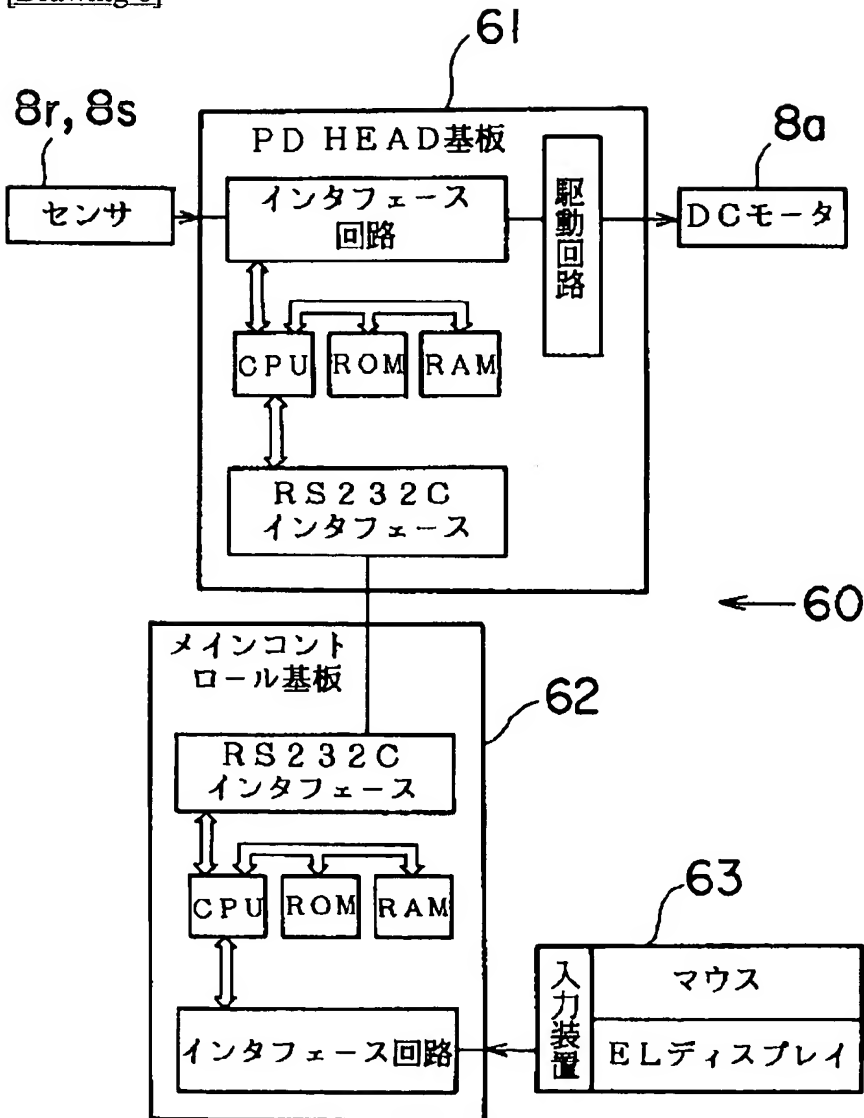
[Drawing 8]



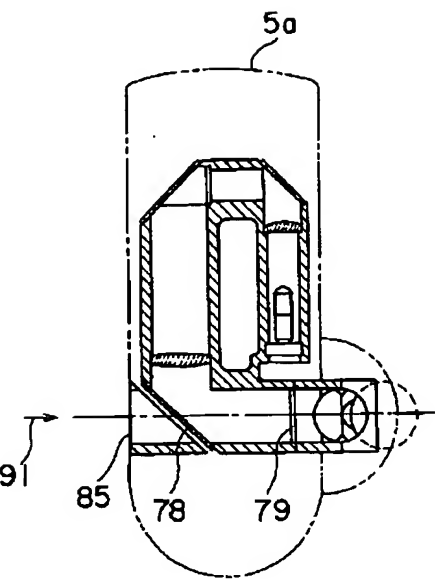
[Drawing 9]



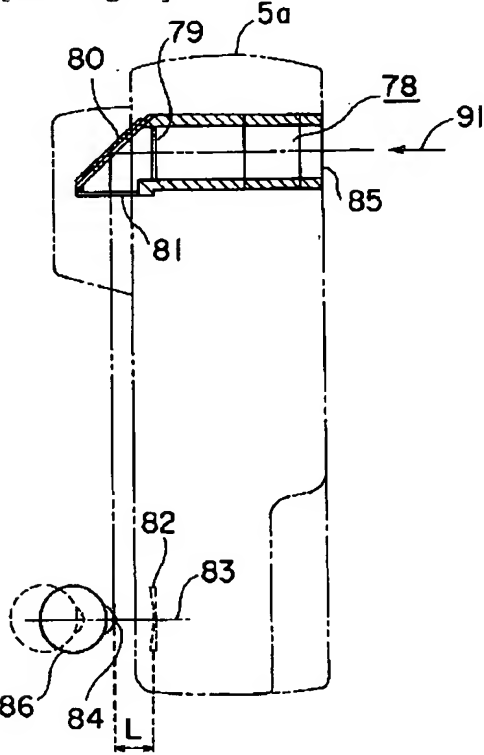
[Drawing 6]



[Drawing 11]



[Drawing 10]



(19)日本国特許庁 (J P)

(12) 公 開 特 許 公 報 (A)

(11)特許出願公開番号

特開平5-168595

(43)公開日 平成5年(1993)7月2日

(51)Int.Cl. ⁵	識別記号	序内整理番号	F I	技術表示箇所
A 6 1 B 3/10		7807-4C	A 6 1 B 3/ 10	Z
		7807-4C		W

審査請求 未請求 請求項の数 6 (全 10 頁)

(21)出願番号 特願平3-343204
 (22)出願日 平成3年(1991)12月25日

(71)出願人 000113263
 ホーヤ株式会社
 東京都新宿区中落合2丁目7番5号
 (72)発明者 秋山 久則
 東京都新宿区中落合2丁目7番5号 ホーヤ株式会社内
 (72)発明者 依田 寿郎
 東京都新宿区中落合2丁目7番5号 ホーヤ株式会社内
 (72)発明者 池田 一公
 東京都新宿区中落合2丁目7番5号 ホーヤ株式会社内
 (74)代理人 弁理士 服部 毅雄

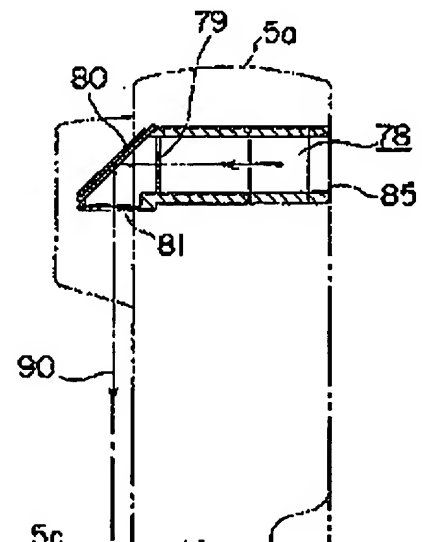
最終頁に続く

(54)【発明の名称】 検眼装置のパーテックス調整装置及び方法

(57)【要約】

【目的】 パーテックスを正確に所定の値に調整できる検眼装置のパーテックス調整装置及び方法を提供することを目的とする。

【構成】 眼の虹彩に光が照射されると、虹彩が輝いて見える点に着目して、被測定者の眼86の大きさに比べ小さい面積の断面を有する光ビームを、測定レンズ82の光軸83に垂直な方向(矢印90)から、測定レンズ82から所定の距離の光軸83上の点84に向け照射する。一方、測定レンズ82と被測定者の眼86の角膜頂点との距離を変化させながら被測定者の眼86を観察窓88を通して矢印87方向から観察し、被測定者の眼86の虹彩に前記光ビームが照射されたときに発生する虹彩の反射光の強度を測定し、測定結果に基づいてパーテックスを調整する。



(2)

特開平5-168595

1

【特許請求の範囲】

【請求項1】 測定ヘッド部を有する検眼装置のバーテックス調整装置において、

被測定者の眼の大きさに比べ小さい面積の断面を有する光ビームを、前記測定レンズの光軸に垂直な方向より、前記測定レンズから所定の距離の前記光軸上の点に向け照射する光ビーム照射手段と、

被測定者の眼を観察する観察窓と、

測定レンズと被測定者の眼の角膜頂点との距離を変化させ、かつ被測定者の眼の虹彩に前記光ビームが照射されたときに発生する前記虹彩の反射光が検出されたとき、前記距離の変化を停止させる変化手段と、

を有することを特徴とする検眼装置のバーテックス調整装置。

【請求項2】 前記光ビーム照射手段からの光ビームは、被測定者の側面から被測定者の眼に向けて照射される請求項1記載の検眼装置のバーテックス調整装置。

【請求項3】 前記光ビーム照射手段から照射される光ビームは、その断面形状が被測定者の上下方向に延びたスリット光であることを特徴とする請求項2記載の検眼装置のバーテックス調整装置。

【請求項4】 検眼装置のバーテックス調整方法において、

光ビームを、測定レンズの光軸に垂直な方向より、測定レンズから所定の距離の前記光軸上の点に向け照射し、測定レンズと被測定者の眼の角膜頂点との距離を変化させ、

被測定者の眼の虹彩に前記光ビームが照射されたときに発生する前記虹彩の反射光が監視され、

前記虹彩の反射光が検出されたとき、前記測定レンズと被測定者の眼の角膜頂点との距離の変化を停止させる、ことを特徴とする検眼装置のバーテックス調整方法。

【請求項5】 前記光ビームは、被測定者の側面から被測定者の眼に向けて照射される請求項4記載の検眼装置のバーテックス調整方法。

【請求項6】 前記光ビームは、その断面形状が被測定者の上下方向に延びたスリット光であることを特徴とする請求項5記載の検眼装置のバーテックス調整方法。

【発明の詳細な説明】

【0001】

【産業上の利用分野】 本発明は検眼装置のバーテックス調整装置および調整方法に関し、特に測定レンズと被測定者の眼の角膜頂点との距離を正確に調整する検眼装置

2

の値に調整した上で、検眼を行う必要がある。

【0003】 従来、検眼装置には被測定者の額が当接される額当て部があり、この額当て部が手動で被測定者の前後方向に移動できるようにされていて、これによってバーテックスを調整する。また、検眼装置には被測定者の眼を、被測定者の側方から観察できる光学系観察装置が設けられている。この観察装置は、その光学系の途中に、バーテックスが所定の値になる所定位置を示した透明の目盛り板と、目盛り板と被測定者の眼との間の視差を無くすための、基準点マークを備えた視準板とを有している。

【0004】 図12は観察装置を通して被測定者の眼を見たときの様子を示す図である。測定者は、観察装置を覗いて自分の眼の位置を僅か移動させて、視準板の基準点121、122と目盛り板の所定位置を示す赤色マーク123とを合致させて視差を無くす。マーク123a～123dは、目盛り板に設けられ、赤色マーク123の前後を示すマークである。その合致状態のまま、被測定者の眼を観察する。観察装置には、側方からの被測定者の眼が見える。そして、額当て部を移動させることによって被測定者の眼の位置を移動させ、被測定者の眼の角膜頂点124を目盛り板の赤色マーク123に合致させる。これにより、バーテックスが所定の値に調整されたことになる。

【0005】

【発明が解決しようとする課題】 しかし、従来の検眼装置の観察装置では、被測定者の眼の角膜頂点位置を見ながら、目盛り板の所定位置に被測定者の眼の角膜頂点が合致することを確認するため、被測定者の眼の角膜頂点位置が観察装置を通して測定者によく見えることが必要であったが、実際にはよく見えていなかった。その原因として、検眼装置の置かれた部屋の照明が暗いことや被測定者の顔を照らす照明が検眼装置に備えられていても眼に光がうまく届かないこと等が考えられる。また、逆に被測定者の眼に強い光を当てると被測定者が眩しがるという問題もあった。

【0006】 また、測定者は、観察装置を覗いて自分の眼の位置を移動させて、視差を無くし、その視差の無い状態のまま、被測定者の眼の角膜頂点を観察する必要があり、測定者にとって視差の無い状態を維持することは容易ではなかった。

【0007】 以上のことが原因になって、従来の検眼装置ではバーテックスを正確に所定の値に調整することは

(3)

特開平5-168595

3

ックス調整装置において、被測定者の眼の大きさに比べ小さい面積の断面を有する光ビームを、測定レンズの光軸に垂直な方向より、前記測定レンズから所定の距離の前記光軸上の点に向け照射する光ビーム照射手段と、被測定者の眼を観察する観察窓と、測定レンズと被測定者の眼の角膜頂点との距離を変化させ、かつ被測定者の眼の虹彩に前記光ビームが照射されたときに発生する前記虹彩の反射光が検出されたとき、前記距離の変化を停止させる変化手段とを有することを特徴とする検眼装置のバーテックス調整装置が、提供される。

【0009】また、検眼装置のバーテックス調整方法において、光ビームを、測定レンズの光軸に垂直な方向より、測定レンズから所定の距離の前記光軸上の点に向け照射し、測定レンズと被測定者の眼の角膜頂点との距離を変化させ、被測定者の眼の虹彩に前記光ビームが照射されたときに発生する前記虹彩の反射光が監視され、前記虹彩の反射光が検出されたとき、前記測定レンズと被測定者の眼の角膜頂点との距離の変化を停止させることを特徴とする検眼装置のバーテックス調整方法が、提供される。

【0010】

【作用】本発明は、眼の虹彩に光が照射されると、虹彩が輝いて見える点に着目して、被測定者の眼の大きさに比べ小さい面積の断面を有する光ビームを、測定レンズの光軸に垂直な方向から、測定レンズから所定の距離の前記光軸上の点に向け照射する。一方、測定レンズと被測定者の眼の角膜頂点との距離を変化させながら被測定者の眼を観察し、被測定者の眼の虹彩に前記光ビームが照射されたときに発生する虹彩の反射光が検出されたとき、測定レンズと被測定者の眼の角膜頂点との距離の変化を停止させる。これにより、簡単に、かつ正確にバーテックスを所定の値に調整できる。

【0011】

【実施例】以下、本発明の一実施例を図面に基づいて説明する。図2は検眼装置の全体構成図である。検眼装置は、近用及び遠用を含めた視機能の測定機構を備えた測定ヘッド部1と、測定ヘッド部1を上下動、水平回転自在に支持する測定ヘッド支持部2と、検眼テーブル部3と、これらを支持する基体部4とから構成される。

【0012】図3は、図2の測定ヘッド部1の背面方向（被測定者側）からの外観図である。測定ヘッド部1は、測定レンズユニット部5とPD機構部6とから構成される。測定レンズユニット部5は、左右用のユニット

4

部5aと右眼用のユニット部5bとの間隔を、被測定者の瞳孔間距離（PD）に応じて調整する機構を内蔵している。

【0013】測定レンズユニット部5の左右眼用のユニット部5a、5bにはそれぞれ測定窓5c、5dがあり、被測定者に両眼でこの測定窓5c、5dをそれぞれ覗かせながら検眼を行う。この検眼に際し、上記の瞳孔間距離の調整の他に、測定窓5c、5dに設置される測定用レンズの光軸を被測定者の眼の視軸に上下方向に対しても一致させる上下方向調整や、測定用レンズと被測定者の眼の角膜頂点との距離（バーテックス）を所定の値、例えば12〔mm〕に調整する前後方向調整が行われる。

【0014】PD機構部6には、頭部支持装置の支持部材7が固定され、支持部材7に前後方向移動装置8（図3には図示せず）、上下移動装置9、被測定者の額が当接される額当て部材10等が設けられる。前後方向移動装置8は、額当て部材10を被測定者の前後方向に動かしてバーテックスを所定の値に調整する装置であり、上下移動装置9は、測定用レンズの光軸を被測定者の眼の視軸に、上下方向に対して一致させる装置である。

【0015】図4は、上記頭部支持装置の支持部材7、前後方向移動装置8、上下移動装置9、額当て部材10等を示し、図3のA-A面の部分断面図である。支持部材7は長方形の金属板であって、PD機構部6にねじ（図示せず）で固定されている。支持部材7には、固定ブラケット11がねじ12で固定される。固定ブラケット11には前後方向移動装置8が取り付けられる。すなわち、固定ブラケット11には、前後方向移動装置8の駆動源である、DCモータ8aがねじ8a、8bで固定されるとともに、ハウジング8dがねじ8e、8fで固定される。DCモータ8aの出力軸には歯付きの駆動プーリ8gが配設される。DCモータ8aには、入力装置が接続された駆動制御装置（図4には図示せず、図6に図示する）が電氣的に接続される。

【0016】ハウジング8dには丸形状のねじ軸8iが、ハウジング8dを貫通して設けられる。ねじ軸8iの一方側には歯付きの従属プーリ8hが固定され、他方側には雄ねじが設けられ、かつ中間部にスラストベアリング8jが設けられる。スラストベアリング8jにより、ねじ軸8iはハウジング8dに対し回転自在であり、かつ前後方向（図4の左右方向）には移動しないようになっている。従属プーリ8hと駆動プーリ8gとの

(4)

特開平5-168595

5

向)に移動自在であり、かつ回転方向には回転しないように設けられる。すなわち、ハウジング8 dには軸方向にキー溝8 nが設けられ、また、移動部材8 mにはキー溝8 nに位置したキーであるセンサピン8 pが固定され、これらキー溝8 nおよびセンサピン8 pの相互作用により、移動部材8 mが、前後方向には移動自在で、回転はしないようされる。センサピン8 pは移動部材8 mの位置検出用にも用いられる。すなわち、ハウジング8 dにはセンサ取り付け板8 qが固定され、センサ取り付け板8 qの2つの所定位置に、センサピン8 pの近接を検知するセンサ8 r、8 sが配設される。センサ8 r、8 sは上記駆動制御装置に接続される。

【0018】センサ8 r、8 sは、移動部材8 mの移動可能範囲の両端限界位置を検出するためのセンサであり、センサピン8 pがセンサ8 r、8 sに近接することにより、それぞれリミット信号を出力する。これらのリミット信号は駆動制御装置に送られ、DCモータ8 aの駆動が制御されるようになっている。

【0019】移動部材8 mの一端には上下移動装置9が取り付けられる。すなわち、移動部材8 mの一端には、片面が平面である支持金具9 aが固定され、この支持金具9 aにはボールブランジャ9 bが埋設される。支持金具9 aの平面側には、薄板状のクリック板9 cが、支持金具9 aに対し図4の上下方向にスライド自在に設けられる。クリック板9 cは4つの穴を有し、ボールブランジャ9 bが上記穴に係合してクリック板9 cを4か所で保持する。クリック板9 cにはスライド金具9 dが接合され、スライド金具9 dには、支持金具9 aおよびクリック板9 cを間に挟んで、スライド金具9 dと共に上下方向にスライドする押さえ金具9 eが固定される。スライド金具9 dには、スライド金具9 dを、被測定者の左右方向(図4の紙面に垂直な方向)に貫通する丸棒から成る平行ピン9 fが設けられる。この平行ピン9 fのスライド金具9 dから突出した両端に、平行ピン9 fの軸を中心に回転自在に額当てブラケット9 gを取り付ける。額当てブラケット9 gには額当て部材10が固定される。額当て部材10は、被測定者の額に沿って左右方向に少し湾曲した平面を有した構造を有している。さらに、スライド金具9 dには、2つのコイルバネ9 h、9 i(図5参照)が設けられ、コイルバネ9 h、9 iは額当て部材10を、平行ピン9 fの軸を中心に図4の反時計方向に付勢する。これらのコイルバネ9 h、9 iの付勢力は、被測定者の額が額当て部材10に当接されたとき、額当て部材10を、平行ピン9 fの軸を中心に図4の時

6

【0020】図5は、頭部支持装置を図4の右側から見た側面図である。図6は駆動制御装置の構成を示すブロック図である。駆動制御装置60はPDヘッド基板61とメインコントロール基板62とから構成され、メインコントロール基板62には入力装置63が接続される。PDヘッド基板61は、センサ8 r、8 sを含めた、PD機構部6の各種センサの入力制御、DCモータ8 aを含めた、PD機構部6の各種モータの出力制御等を行う制御装置を搭載している。PDヘッド基板61では、入力装置63からメインコントロール基板62を介して入力されるモータ駆動の開始および停止の指令信号およびセンサ8 r、8 sからのリミット信号に従い、DCモータ8 aに正転または反転用の電流を供給している。メインコントロール基板62は、PDヘッド基板61とのデータ通信を含め、図には示さない電源通信基板とのデータ通信、データ表示装置の制御、各種ランプやソレノイドの制御、マウスの制御、プリンタの制御等の、検眼装置全体の各種制御を行う制御装置を搭載している。

【0021】つぎに、以上のように構成される頭部支持装置の作動を説明する。まず、前後方向移動装置8の作動を説明する。駆動制御装置60に接続された入力装置63に、測定者によって額当て部材10を前方向または後方向に動かす指令が与えられると、PDヘッド基板61からDCモータ8 aに駆動電流が供給される。これによりDCモータ8 aがいずれかの方向に回転する。その回転はDCモータ8 aの出力軸、駆動プーリ8 g、歯付ベルト8 k、従属プーリ8 hを順に介してねじ軸8 jに伝達される。ねじ軸8 jの雄ネジおよび移動部材8 mの雌ネジの作用により、ねじ軸8 jの回転運動が移動部材8 mの直線運動に変換される。したがって、DCモータ8 aの回転に応じて移動部材8 mが被測定者の前後方向に移動する。移動部材8 mの前後方向への移動で、額当て部材10も前後方向へ移動する。

【0022】額当て部材10の前後方向への移動によって、後に詳述するように、被測定者の虹彩が離れたとき、すなわち、額当て部材10に額を当てていた被測定者の実際のパッチェックスが所定の値になったときに、測定者が入力装置63に、額当て部材10の移動を停止させる指令を出すようにする。これにより額当て部材10を所望の位置に調整することができる。

【0023】なお、センサピン8 pがセンサ8 rまたはセンサ8 sに近接したとき、すなわち、移動部材8 mが前後移動範囲の両端限界位置に至ったときには、センサ

(5)

特開平5-168595

7

る。まず、検眼装置の測定ヘッド部1を測定ヘッド支持部2の機能により上下方向に移動して、測定レンズユニット部5の測定窓5c、5dを被測定者の眼の位置に合わせる。つぎに、額当て部材10を支持金具9aに対し上下方向に動かし、クリック停止する4つの位置のうちのいずれかで、額当て部材10が被測定者の額に当接するように調整する。

【0025】つぎに、以上のように前後方向移動装置8によってバーテックスが変化されたときに、バーテックスが所定の値になったことを検出する手段について説明する。

【0026】図1は図2における測定レンズユニット部5のB-B断面図であり、図7は図2における測定レンズユニット部5のC-C断面図である。まず、図7において、ランプ71から出射された光は、光路構成部72でガイドされ、集光レンズ73で集光されてミラー74を経てターゲット75に至る。ターゲット75は図8(C)に示すようにスリット75aを有している。

【0027】ターゲット75のスリット75aを通過した光は、ミラー76、対物レンズ77、ハーフミラー78、視準板79を介し、図1に移って、さらに、ミラー80、目盛り板81を介して、測定レンズユニット部5に設けられた測定レンズ82の光軸83に至る。測定レンズ82は測定窓5cに対向して測定レンズユニット部5の内部に設けられている。このスリット光が光軸83に至る点84は、測定レンズ82のバック面からの距離Lが所定の値、例えば12〔mm〕になるように調整される。対物レンズ77は、ターゲット75のスリット75aの像が点84上に結像するように調整され、かつ、ターゲット75の向きは、点84に結像されるスリット75aの長手方向が図1の紙面に垂直な方向になるように設置される。したがって、後述するように、スリット光が被測定者の側面に照射されたとき、スリット光は被測定者の上下方向に延びている。

【0028】図8(A)は視準板79を、図8(B)は目盛り板81を示す。本実施例では、ハーフミラー78を通して、従来の装置のように、観察窓85からもバーテックスの調整ができるように、視準板79および目盛り板81を設置している。勿論、視準板79および目盛り板81は、本発明にとって必須の要件ではない。

【0029】以上のように構成されるバーテックス検出手段を用いて、バーテックスが所定の値になったことを検出する手順をつぎに説明する。まず、PD機構部6に

8

させると同時に、測定者は矢印87の方向から観察窓88を通して被測定者の眼86を観察する。前後方向移動装置8は、通常、被測定者の額を遠方から次第に測定レンズユニット部5に近づけるように作動する。

【0030】図9(A)は、矢印90(図1)の方向から見たスリット光および被測定者の眼を示す。上述のようにターゲット75のスリット75aを透過した光が光軸83上の点84にスリット光89として結像している。そのスリット光89の位置に前後方向移動装置8により被測定者の眼86が近づき、被測定者の眼86の先端にスリット光89が照射されると、角膜を経て虹彩に光が届き被測定者の眼86の虹彩が輝く。すなわち、眼を正面から表した図9(B)に示すように、眼86は中心部に虹彩86aがあり、この虹彩86aは、外部から光が照射されると強く反射する性質がある。そのため、スリット光89が被測定者の眼86の先端に照射されると、角膜を経て虹彩86aに光が届き被測定者の眼86の虹彩86aの一部86aaが輝いたように見える。したがって、測定者が矢印87の方向から観察窓88を通して被測定者の眼86を観察していれば、被測定者の眼86の虹彩86aが輝く瞬間を確認でき、かくして、スリット光89が被測定者の眼86の先端に到達した瞬間、すなわち、バーテックスが所定の値になった瞬間を検出できる。この瞬間に測定者は入力装置63を操作して前後方向移動装置8の作動を停止させる。

【0031】このバーテックス検出手段の検出手法は、角膜位置を検出する従来手法に比べ、虹彩の輝きを検出するため、バーテックスが所定の値になった瞬間が非常に確認し易い。また、測定者は、視差合わせをする必要がなく、単に観察窓88を通して被測定者の眼86を観察しているだけでよく、測定者の眼の位置が少しぐらい移動してもその観察に影響は出ない。

【0032】本実施例には、スリット光を使用せず、従来の装置のように、観察窓85から測定者が被測定者の眼の角膜頂点の位置を観察してバーテックスの調整もできるように、視準板79および目盛り板81を設置している。この調整の手順を図10、図11を用いて説明する。

【0033】図10は図1に対応し、図11は図7に対応する測定レンズユニット部5の断面図である。測定者は矢印91の方向から観察窓85を覗き、自分の眼の位置を少し移動して視準板79の基準点マーク79a、79bと目盛り板81の赤色マーク81a(図8参照)と

40

(5)

特開平5-168595

9

10

【0034】以上の実施例では、被測定者の眼に側面から照射される光をスリット光としたが、必ずしもスリット光ではなく、点状のスポット光でもよい。いずれにしても光軸83に照射される光は光軸83方向には幅の狭い光ビームであればよい。

【0035】また、前後方向移動装置8は、測定者による入力装置63への操作により、バーテックスが所定の値になったとき、作動が停止するようになっているが、別に、前後方向移動装置8の作動を停止させる停止手段を設け、被測定者の眼の虹彩の反射が検出されたときに自動的にまたは手動で上記停止手段を作動させてもよい。

【0036】

【発明の効果】以上説明したように本発明では、光ビームを、測定レンズの光軸に垂直な方向より、測定レンズから所定の距離の前記光軸上の点に向け照射し、被測定者の眼の虹彩に光ビームが照射されたときに発生する虹彩の反射光に基づきバーテックスを所定の値に調整するように構成した。このため、角膜位置を検出する従来手法に比べ、虹彩の輝きを検出するため、バーテックスが所定の値になった瞬間が非常に確認し易い。また、測定者は、視差合わせをする必要がなく、単に観察窓を通して被測定者の眼を観察しているだけでよく、測定者の眼の位置が多少くらい移動してもその観察に影響は出ない。したがって、バーテックスを正確に所定の値に調整することが可能になった。

【図面の簡単な説明】

【図1】本発明の測定レンズユニット部の断面図である。

【図2】検眼装置の全体構成図である。

【図3】図2の測定ヘッド部の背面方向（被測定者側）からの外観図である。

【図4】頭部支持装置の支持部材、前後方向移動装置、上下移動装置、額当て部材等を示す部分断面図である。

【図5】頭部支持装置を図4の右側から見た側面図である。

【図6】駆動制御装置の構成を示すブロック図である。

【図7】図2における測定レンズユニット部のC-C断

面図である。

【図8】（A）は視準板を、（B）は目盛り板を、（C）はターゲットを示す図である。

【図9】（A）は図1の矢印90の方向から見たスリット光および被測定者の眼を、（B）は正面から見た眼を示す図である。

【図10】スリット光を使わないときの図1に対応する測定レンズユニット部の断面図である。

【図11】スリット光を使わないときの図7に対応する測定レンズユニット部の断面図である。

【図12】従来の観察装置を通して被測定者の眼を見たときの様子を示す図である。

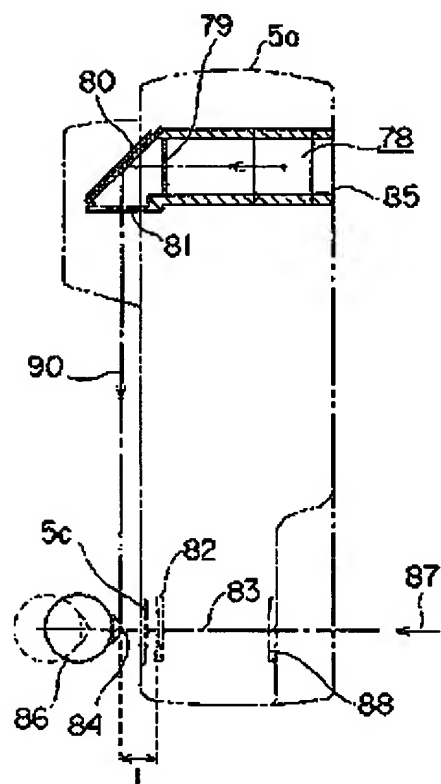
【符号の説明】

- 1 測定ヘッド部
- 2 測定ヘッド支持部
- 3 検眼テーブル部
- 4 基体部
- 5 測定レンズユニット部
- 6 PD機構部
- 7 支持部材
- 8 前後方向移動装置
- 9 上下移動装置
- 10 額当て部材
- 11 ランプ
- 13 集光レンズ
- 14 ミラー
- 15 ターゲット
- 15a スリット
- 16 ミラー
- 17 対物レンズ
- 18 ハーフミラー
- 19 視準板
- 20 ミラー
- 21 目盛り板
- 22 測定レンズ
- 23 光軸
- 24 点

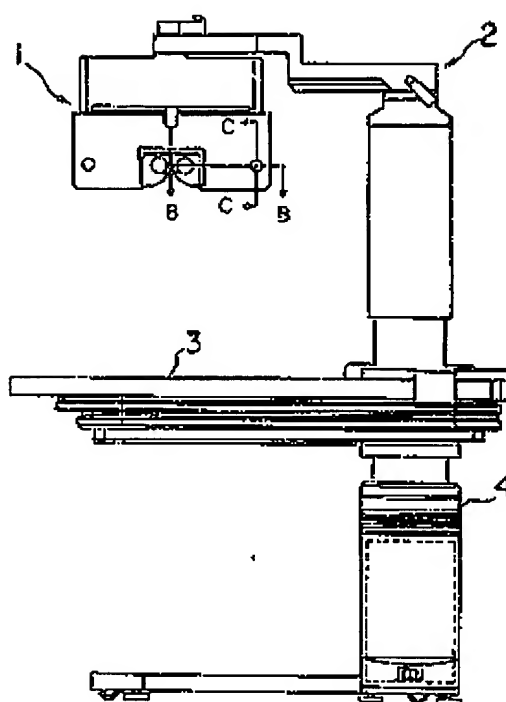
(7)

特開平5-168595

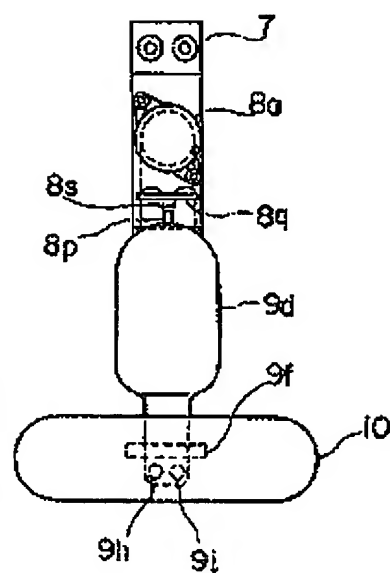
【図1】



【図2】

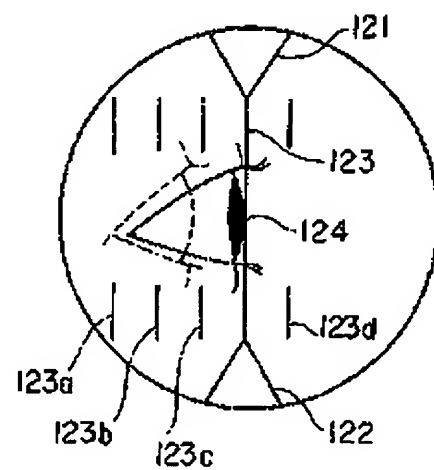
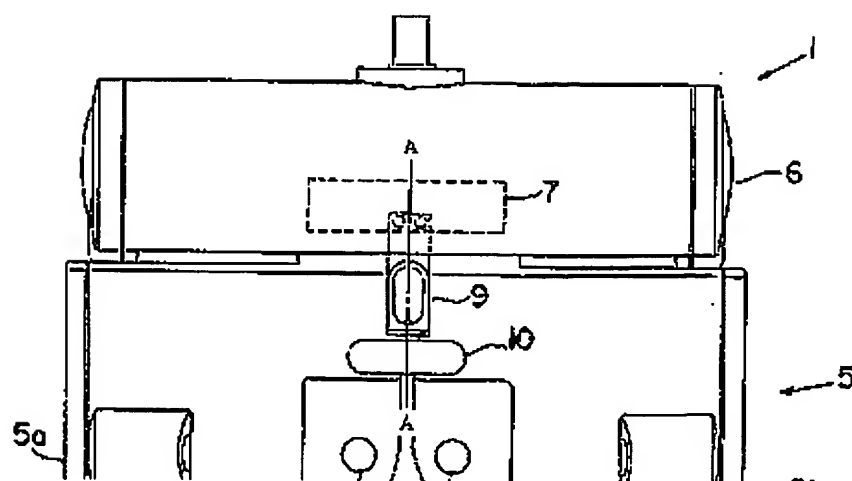


【図5】



【図12】

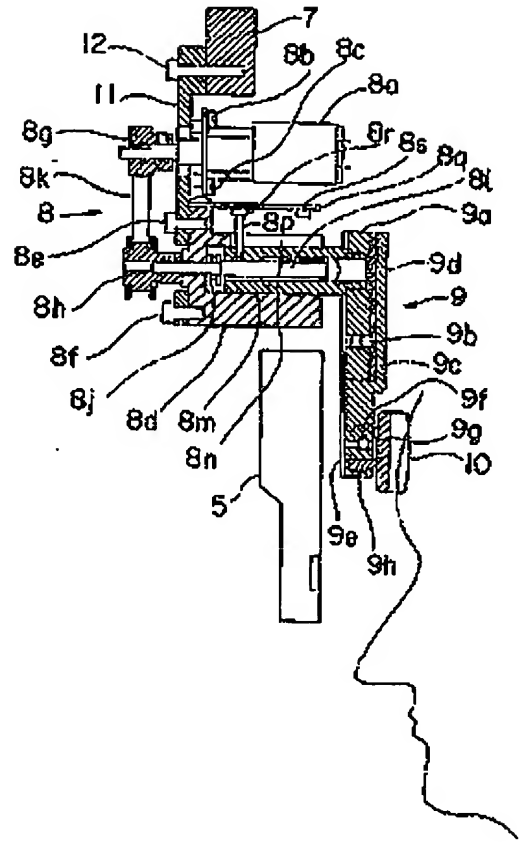
【図3】



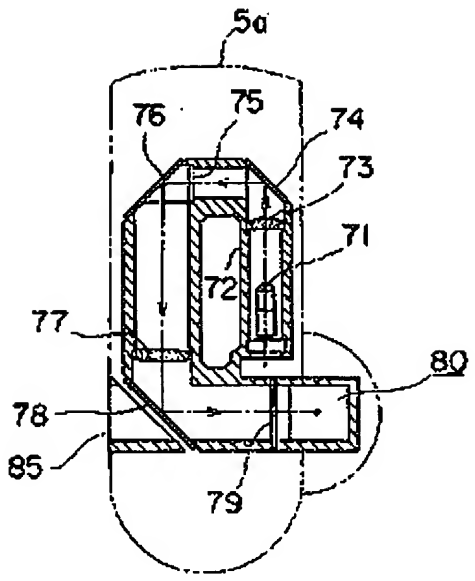
(8)

特開平5-168595

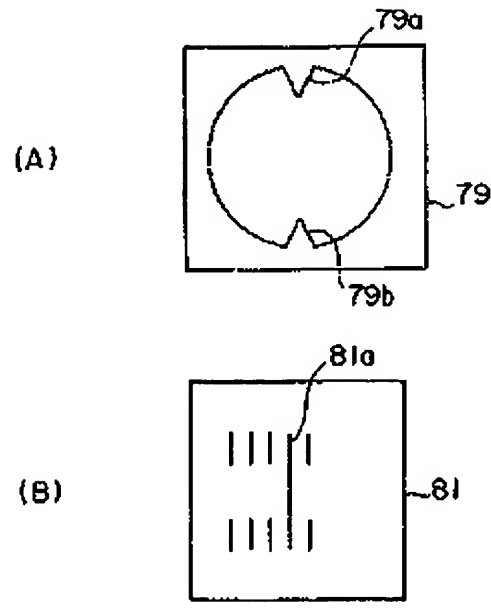
【図4】



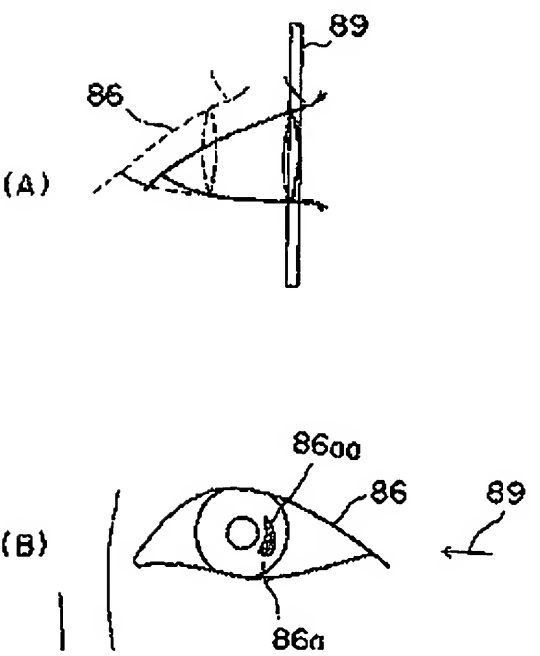
【図7】



【図8】



【図9】

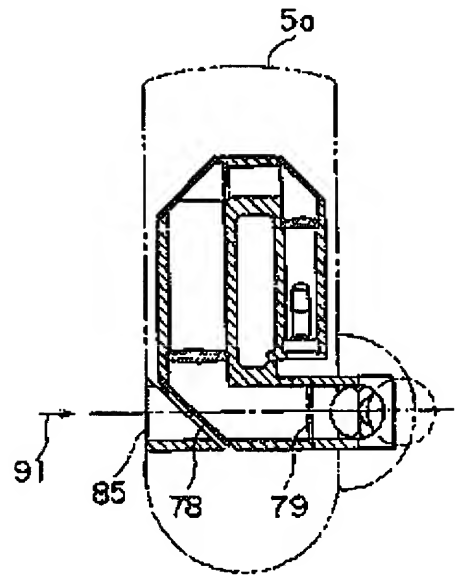
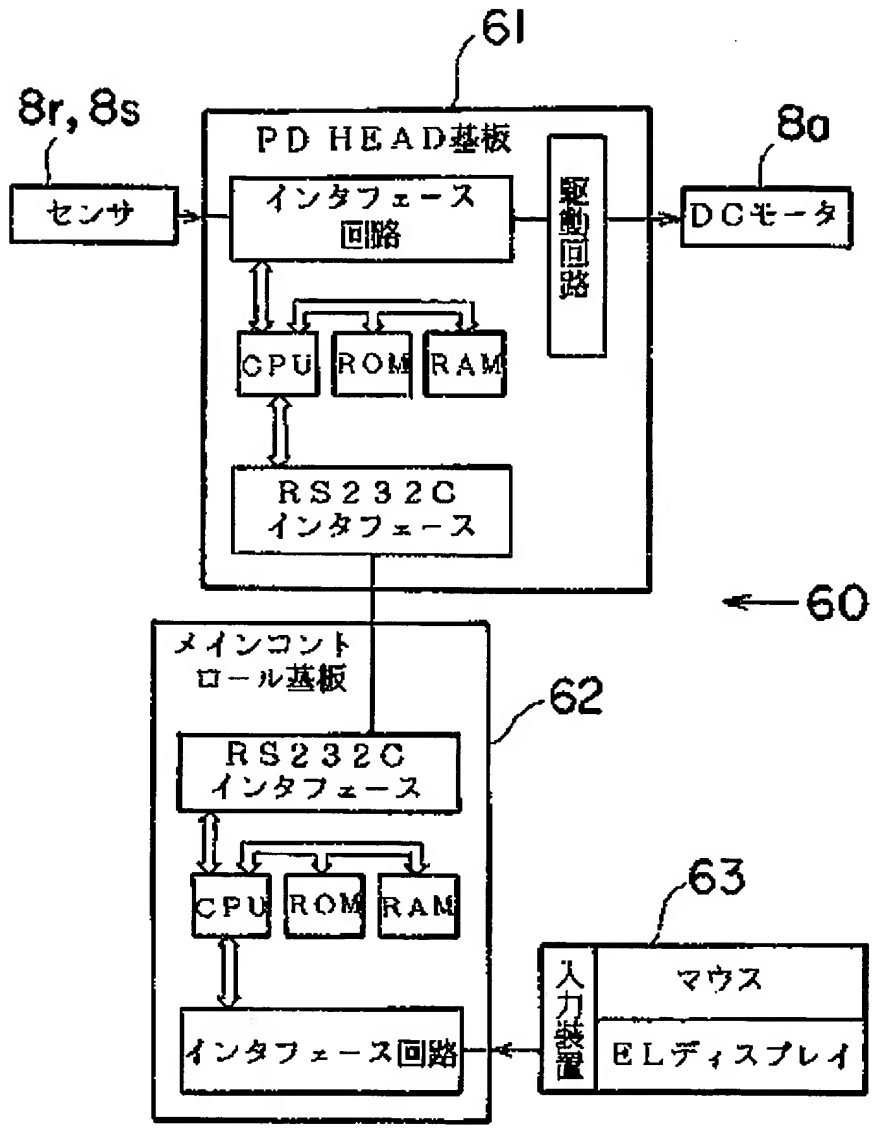


(9)

特開平5-168595

【図6】

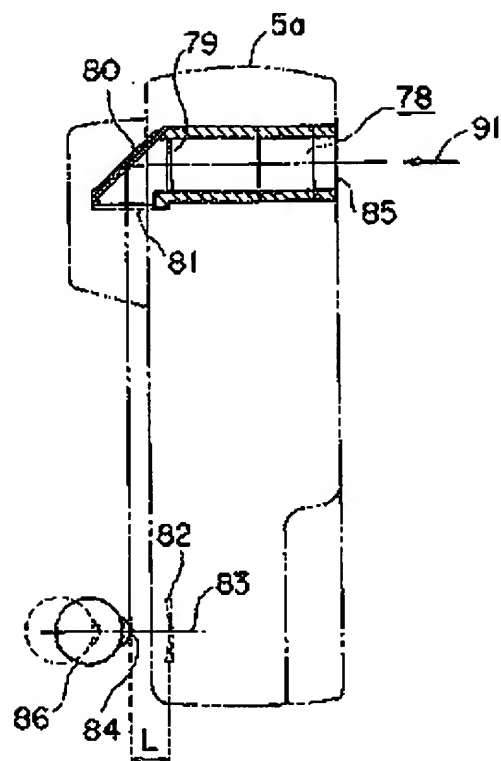
【図11】



(10)

特開平5-168595

【図10】



フロントページの続き

(72)発明者 伊藤 憲彦
東京都新宿区中落合2丁目7番5号 ホー
ヤ株式会社内